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Chemical Composition and Supplemental Effects of Levels of Euphorbia Tirucalli and Acacia Albida Pods on Feed Intake of Goats

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ABSTRACT
The experiment was conducted to evaluate supplemental value of mixtures of different levels of Euphorbia tirucalli (EUt)) and Acacia albida pods (AAp) on feed intake and body weight change using twenty-five intact Abergelle goats with initial body weight (BW) of 13.9 ± 1.15 (mean ± SD). Randomized complete block design with 5 blocks were employed for the study and animals were blocked based on their initial BW. Treatments were natural pasture hay fed ad libtum alone (T_1) or with 210 g/day AAp (T_2), 210 g/day EUt (T_5) or 140 AAp + 70 EUt g/day (T_3) and 70 AAp +140 EUt g/day (T_4). All animals were offered 52 g dry matter (DM)/day sesame cake. Drinking water and mineralized salt block were available free choice. The experiment had 90 days feeding time. The CP content of the AAp, EUt and hay was 17.8%, 7.4% and 7.3%., respectively. Goats in T1 consumed higher ($P < 0.05$) natural pasture hay (433.7 g/day) compared to the supplemented groups (321.7, 319, 315.5 and 315.9 g /day) for T_2, T_3, T_4 and T_5, respectively. Higher ($P < 0.05$) total DM intake of 561.4, 565.4, 540.9 and 531 g/day for T_2, T_3, T_4 and T_5, respectively were recorded than T_1 (486.5 g/day). CP intake was the lowest for T_1 and increased with increasing level of AAp in diet of supplemented goats (52, 77, 71, 62 and 56 g/day). Therefore, it is concluded that AAp supplementation has better impact as compared to the sole EUt supplemented goats.
Key words: Acacia albida, Euphorbia tirucalli, Goat and intake.

INTRODUCTION

In order to solve the chronic shortage of feeds in terms of availability and quality for improved productivity of animals, locally available feed sources have to be used and made available to users, particularly during the dry season (Bruh, 2008**).** Concentrate feed supplementation is one strategy, which can increase digestibility, nutrient supply and intake (Preston and Leng, 1987). However, concentrate feed resources especially grains are expensive and highly valued as human food. Therefore, it is imperative to look for other alternative feedstuffs like mixing different types of pods and other plant parts which do not compete with human food.

Acacia. albida pods have high nutritive value (Tanner *et al*., 1990). The higher CP and lower crude fiber (CF) contents in pods suggest that they may be used as a supplement to low CP feeds (Lebbie *et al*., 1994) such as *Euphorbia tirucalli* which has 5.96% CP (Dougal and Shelderick, 1964). The feeding value can be improved by mixing these two plants. Therefore, the objective of this study was: To evaluate the supplemental value of mixture of different levels of *A. albida* pods with *E. tirucalli* on feed intake of Abergelle goats fed native hay as basal diet.

MATERIALS AND METHODS

Study Site

The study was conducted in Central Zone of Tigray Naedier Adiet Woreda. The altitude of the area is 1981 meters above sea level and is found between 14° 00' N latitude and 38° 37' E longitude. The average annual temperature of the area is 26 °C and the annual rainfall ranges from 400 to 650 mm.

Management of Animals and feeding

The goats used in this study were twenty-five intact Abergelle breed aged between eleven to fifteen months. There were five treatments and each treatment had five animals which were allocated to the treatments randomly using completely randomized block design (RCBD). The animals were confined in individual pens and fed individually. Known amount of the basal diet was given then leftover weighed the following morning just before offering for that day. The supplements were given in two halves, one half in the morning and the other half in the evening. The animals were given fifteen days adjustment period before data collection was started. Animals were

weighed every two weeks for the whole experimental period of twelve weeks. Before the experiment was started, the animals were dewormed and sprayed to control internal and external parasites, respectively. Water and mineral salts were provided to the animals *ad libitum* in the individual pens.

Treatment diets

Table 1. Experimental treatments

			Supplements	
Treatmes	Grass Hay	SC(gDM/d/goa)	AAp (g DM/day/goat)	EUt (g DM/day/goat)
T_1	*Ad libitum*	52	0	0
T_2	*Ad libitum*	52	210	0
T_3	*Ad libitum*	52	140	70
T_4	*Ad libitum*	52	70	140
T_5	*Ad libitum*	52	0	210

AAp = *Acacia albida* pods; DM = dry matter; EUt = *Euphorbia tirucalli*; SC= sesame cake

Native hay was used as a basal diet and was offered ad libitum to all the animals in the treatments. The hay was obtained from the local area (experimental site). *Acacia albida* pods were harvested by farmers from the communal land of the experimental site. The pods were mainly matured and dried well which had dropped from the trees and picked from the ground. The hay and pods were chopped to an approximate size of 2.5 cm and stored in sacks individually. *A. albida* seeds were manually grounded separately from the pulp by using traditional grinder then mixed to the pulp. *E. tirucalli* was cut every day in the morning and wilted for two days before being offered to the animals. During feeding time, *E. tirucalli* was chopped and mixed with the already chopped *A. albida* pods based on levels set for each mixture treatments. All animals were also receiving 52g DM/day sesame cake to correct for a possible protein deficiency of the basal diet. The animals were offered the daily supplement in two equal halves at 08:00 h and 16:00 h of the day. All supplements were given on DM basis. Treatments diets were hay, *A. albida* pods and *E. tirucalli*.

Measurement of intake

Feed offered and refusals were recorded daily to determine daily feed intake by subtracting refusal from offered. Feed samples from each feed and refusals from each animal were sampled. The hay left over was weighed every morning between 06.00 h and 08.00 h, but left over of supplements were weighed at every morning and night. Sesame cake was offered every day morning before supplement. At the end of feed trial, daily refusal and offered samples were thoroughly mixed well for each animal and each feed, respectively and sub-sampled. Refusal samples for each feed type were bulked per treatment for chemical analysis. Measurements were recorded for 12 weeks.

Chemical Analysis

Samples of feed offered and refusals were subjected to laboratory analysis for dry matter (DM), CP and ash determination following the procedure of AOAC (1990). The acid detergent fiber (ADF), neutral detergent fiber (NDF) and acid detergent lignin (ADL) contents of feed and refusal samples were determined following the procedures of Van Soest and Robertson (1985).

Statistical Analysis

Data from the experiment were subjected to analysis using the General Linear Model procedure of SAS (2002). The treatment means were separated by least significant difference (LSD). The model used for data analysis was: $Y_{ij} = \mu + T_i + B_j + e_{ij}$.

Where: Y_{ij} = response variable. μ = overall mean. T_i = treatment effect. B_j = block effect. e_{ij} = random error

RESULTS

Chemical composition of the feeds

The chemical compositions of feeds used in the experiment are presented in Table 2. Acacia albida pods (AAP) was higher in DM, OM and CP than Euphorbia tirucalli. The hay and EUt had lower CP than AAp (Table 2). Table 3 presents daily DM and nutrients intake data**.**

Table 2. Chemical composition of experimental feeds and refusals.

		% of the DM				
Sample type	DM	OM	CP	NDF	ADF	ADL
Hay	93.5	90.3	7.3	71.4	52.2	7.4
SC	94.4	89.9	38.3	30.6	23.9	11.5
AAp	93.2	95.8	17.8	43.9	34.7	4.3
AAp+EUt (140 g + 70 g)	74.5	94.1	13.9	44.0	35.5	4.4
AAp+EUt (70 g + 140 g)	42.2	92.9	10.6	48.3	35.4	5.1
EUt	18.4	84.5	7.4	52.5	35.6	5.8

AAp = Acacia albida pods; ADF= acid detergent fiber; ADL= acid detergent lignin; EUt= Euphorbia tirucalli; CP= crude protein; DM=dry matter; NDF = neutral detergent fiber; OM = organic matter;

Feed Intake

Table 3 below shows the mean daily DM and nutrient intake of experimental goats during the feeding trial. The mean daily DM intake of hay of unsupplemented goats was significantly higher ($P < 0.05$) than the supplemented goats, but hay DM intake was similar among the supplemented goats.

Table *3*. Nutrient intake of Abergelle goats

	Treatments					
Parameters	T_1	T_2	T_3	T_4	T_5	SEM
Hay DMI (g/day)	433.7^{a}	321.7^{b}	319.0^{b}	315.5^{b}	315.9^{b}	9.88
SC DMI (g/day)	52	52	52	52	52	-----
SPF DMI (g/day)	-----	186.9^{ab}	193.3^{a}	172.6^{bc}	162.3^{c}	4.18
Total DMI (g/day)	486.5^{c}	561.4^{a}	565.4^{a}	540.9^{ab}	531.0^{b}	6.92
DMI (% BW)	2.9	3.2	2.9	3.1	2.9	0.50
OMI (g/day)	439.0^{c}	517.0^{a}	517.8^{a}	496.7^{ab}	469.9^{b}	7.01
CPI (g/day)	51.9^{e}	77.0^{a}	70.5^{b}	61.60^{c}	55.6^{d}	2.40
NDFI (g/day)	325.8	327.9	329.2	324.8	326.9	2.42
ADFI (g/day)	239	245.5	248.4	238.7	235.1	2.01
Substitution rate	-----	0.6	0.59	0.7	0.73	0.03

^{a,b,c} Means having significantly different; ADFI = acid detergent fiber intake; CPI = crude protein intake; DMI = dry matter intake; NDFI = neutral detergent fiber intake; OMI = Organic matter intake; SEM = standard error mean; SPF = supplemental feeds; T_1 = hay ad libtum + 52 g DM/day/goat sesame cake; T_2 = T_1 + 210 g DM/day/goat Acacia albida pods (AAp); T_3 = T_1+ 140 g Aap+70 g EUt DM/day/goat; T_4 = T_1+ 70 gAAp+140gEUt DM/day/goat; T_5 = T_1+ 210 g DM/day/goat Euphorbia tirucalli (EUt).

The total DM intake of unsupplemented goats was significantly lower ($P < 0.05$) than the supplemented groups. The total DM intake of 210 g/day (T_2) and 140 g AAp + 70 EUt g/day (T_3) supplemented animals were significantly higher ($P < 0.05$) than the 210 g/day E. tirucalli (T_5) supplemented ones. The goats supplemented with 70 g AAp + 140 g EUt/day (T_4) did not show significant difference ($p > 05$) with all supplemented groups. Intake of OM took similar trend like that of DM intake. Among the supplemented goats CP intake increased with increasing level of A. albida supplementation.

DISCUSSION

Supplementation decreased intake of the basal diet. This is due to substitution effect of the supplement diets. Similar reports of decrease in basal feed have been reported in other studies (Mulu, 2005). The basal diet (hay) contained high or 71.4% NDF and 52.2% ADF, which have direct negative impact on feed intake. The high total DM intake of 210 g (T_2) and 140 g AAp + 70 g EUt (T_3) compare to 210 g EUt (T_5) supplemented goats might be due to the effect of comparatively lower CP content in *E. tirucali* than *A. albida* pods that

might have limited the intake of E. tirucalli. Pond *et al.* (1995) reported that consumption of low quality roughages such as straw and poor hay can be increased by the addition of protein supplements. The high moisture content of *E. tirucalli* as compared to *A. albida* pods might have also played a role in reduced intake. The basal diet (hay) contained 71.4% NDF and 52.2% ADF, which have direct negative impact on feed intake and digestibility. Cheeke (1999) stated that NDF is one of the major factors that affect forage intake and digestibility because it is the major component to affect ruminal fill. The author also stated that, deficiency of nutrients, especially of CP for rumen microbes would reduce voluntary intake.

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